

Event-B Example

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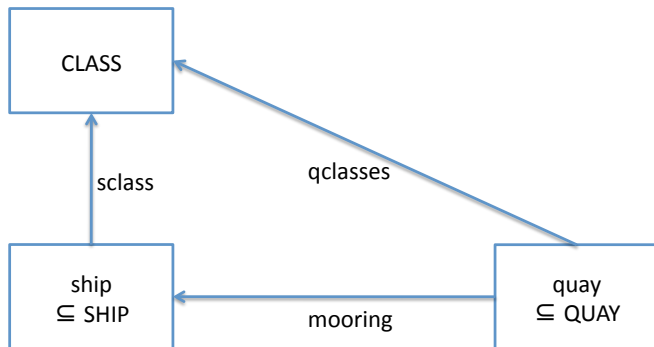
University of Southampton

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Port Management System

1. A shipping port provides a limited number of **quays** at which **ships** may **dock**. A quay can hold one ship
2. Each ship belongs to a **class** (denoting its physical berthing requirements, eg length, draught)
3. A ship can only dock at a quay supporting that class

Class diagram for the port management system



Injective Functions

One-to-one function: different domain elements are mapped to different range elements.

In other words, in **inverse is also a function**.

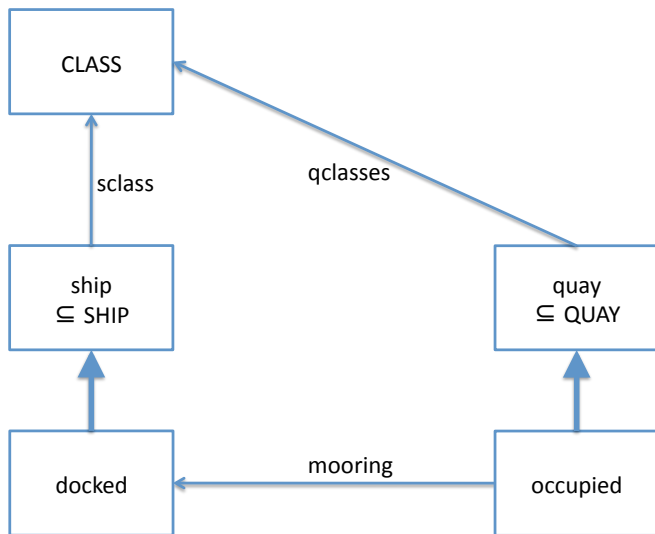
To declare f as an injective function:

$$f \in X \rightsquigarrow Y$$

This is defined in terms of the inverse of f as follows:

Predicate	Definition
$f \in X \rightsquigarrow Y$	$f \in X \rightarrow Y \wedge f^{-1} \in Y \rightarrow X$

Class diagram with subsetting (inheritance)



Total Injective Functions

Just as for standard total functions, we can declare an injective function to be **total on some set**.

To declare f as a total injective function:

$$f \in S \twoheadrightarrow Y$$

This is defined as follows:

Predicate	Definition
$f \in S \twoheadrightarrow Y$	$f \in S \twoheadrightarrow Y \wedge \text{dom}(f) = S$

Extending the Port Management System

1. Besides a class, each ship has a number of **processing requirements**
2. Thus a ship can only dock at a quay supporting **all** its processing requirements
3. An arriving ship will either
 - ▶ dock immediately, if a suitable quay is available, or
 - ▶ join a queue of ships waiting to berth, subject to a defined queue capacity for later docking